

## B.1 Determining Relative Age

### I. Uniformitarianism

- A. Geologists estimate Earth's age to be 4.6 billion years
- B. James Hutton theorized that by studying the present, in terms of geology, people could learn about Earth's past.
  1. Uniformitarianism - a principle that geologic processes that occur in the past can be explained by current geologic processes
- C. Earth's age
  1. A way to learn about Earth's past is to determine the order in which rock layers formed

### II Relative Age

- A. Layers of rock called strata, show the sequence of events that took place in the past
  1. Scientists commonly study the layers in sedimentary rock to determine relative age of rocks

### III Law of Superposition

- A. As sediments accumulate, they are compressed and harden into sediment rock layers called beds
  1. The boundary between two beds is called a bedding plane
- B. Law of superposition - the law that a sedimentary rock layer is older than the layers above it and younger than the layers

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### II Principle of Original Horizontality

- A. Graded Bedding - arrangement of bedding when coarse/heavy particles are located in the bottom layers
- B. Cross Beds - when sand is deposited, sandy sediment form curved beds at an angle to the bedding plane
- C. Ripple Marks - small waves that form on the surface of sand due to action of water or wind

### V. Unconformities - a break in the geologic record

- A. When rock layers are eroded or sediment is not deposited for a long period of time
  1. Three major types of unconformities
    - a. Nonconformity - stratified rock layers rest upon unstratified rock
    - b. Angular conformity - boundary between a set of horizontal layers + tilted layers
    - c. Disconformity - the boundary between horizontal layers of old + younger sedimentary rock, overlying layers are deposited on an eroded surface
  2. Law of crosscutting relationships - a fault or igneous intrusion is younger than the rock layer cutting through it

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# 8.1 Review

Grade: 9th  
Subject: Earth Science  
Date: 1/2/12

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1 The idea that younger rocks lie on top of older rocks is \_\_\_\_\_.

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2 A missing layer of rock is known as \_\_\_\_\_.

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3 A break in the geologic record is disconformity.

True

False

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4 How are rock layers arranged in the geologic column?

- A youngest rocks are in the middle
- B youngest rocks are on the bottom
- C oldest rocks are on the bottom
- D oldest rocks are on the top

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5 What is a fault?

- A molten rock that squeezes into existing rock
- B a break in the Earth's crust
- C slanted layers of rock
- D a bent and buckled layer of rock

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6 What is the most common type of unconformity?

- A a disconformity
- B an angular disconformity
- C a nonconformity
- D a fault

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7 How does a geologist know that rock layers are undisturbed?

- A rock layers are folded
- B rock layers are horizontal
- C rock layers are tilted
- D rock layers are faulted.

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## 8.2 Determining Relative Age

### I. Absolute Dating Methods

A. Absolute Age - the numeric age of an object or event

B. Rates of Erosion

1. One way to estimate absolute age is to study rates of erosion

C. Rules of Deposition

1. Another way to calculate absolute age is to calculate the rate of sediment deposition; this method not always accurate

D. Varve Count

1. Some sedimentary deposits show definite annual layers called varves

a. Varves consist of a light-colored band of coarse particles and a dark band of fine particles

b. Varves generally form in glacial lakes

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II Radio metric Dating - determines absolute age by comparing %s of the radioactive parent isotope to the daughter isotope

A. Rocks generally contain small amounts of radioactive material that can act as natural clocks

1. Isotopes = atoms of element w/ different amounts of neutrons

2. Radioactive isotopes - have nuclei that emit particles and energy at a constant rate regardless of surrounding into its daughter isotopes

B. Half-life - time for half of radioactive isotope's mass to decay into its daughter isotopes

1. Radioactive decay happens at a relative constant rate that is not by temp, press or environmental conditions

C. Radioactive Isotopes

1. The amount of time that has passed determines which radioactive element gives the best age estimate

D. Carbon - Dating - used to date rock less than 70,000 years old  $^{14}\text{C}$

A. Process known as carbon-14 dating

1. All living  $^{14}\text{C}$   $\rightarrow$   $^{12}\text{C}$

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## 8.2 Review

Grade: 8th  
Subject: Physical Science  
Date: 1/3/12

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1 Unstable isotopes are what we call \_\_\_\_\_.

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2 The method that dates rocks older than 100,000 years old is the potassium-argon method.

True

False

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3 The time it takes for one-half of a radioactive sample to decay is known as \_\_\_\_\_.

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4 The process in which radioactive isotopes break down into stable isotopes is ~~absolute~~ decay

radioactive

True

False

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5 Which of the following are isotopes?

- A atoms with the same number of protons and neutrons
- B atoms with the same number of protons but different numbers of neutrons
- C atoms with the same number of neutrons
- D atoms with the same number of electrons

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- 6 What does a scientist need to know to figure out the absolute age of a rock?
- A the rate of decay for all elements in the rock
  - B The rate of decay for a radioactive element in the rock
  - C The rate of superposition for a radioactive element in the rock
  - D the rate of decay of the rock's half-life

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- 7 Which two methods of radiometric dating are used for rocks more than 10 million years old?
- A rubidium-strontium and uranium-lead
  - B rubidium-strontium and potassium-argon
  - C rubidium-strontium and carbon-14
  - D rubidium-strontium and carbon-12

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### 8.3 The Fossil Record

#### I. Interpreting the Fossil Record

- A. Fossils - the remains of animals or plants that lived in a previous age; commonly preserved in sedimentary rock
- B. Paleontology - the scientific study of fossils
- C. Fossil record provides information about changes in the environment and the geologic history of Earth

#### II. Fossilization

- A. Normally, dead plants and animals are eaten/decomposed by bacteria
  - B. Generally only hard parts of organisms (bones, teeth, wood, shell, etc.) become fossils
- see Table 1, p. 198-9 for different ways that fossils form

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#### III Types of fossils

- A. In some cases, no part of the original organism survives in fossil form
- B. Trace Fossil - fossilized evidence of past animal movement such as tracks, footprints, borings, and burrows often formed in sedimentary rock

#### IV Index Fossils - fossils that occur only in rock layers of a particular geologic age

- A. Scientists can use index fossils to estimate ages of specific rock layers
  - 1. Also, index fossils to help locate rock layers that contain oil and natural gas deposits

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## 8.3 Review

Grade: 9th  
Subject: Earth Science  
Date: 1/4/12

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1 What is amber?

- A a hard shell
- B an insect's body
- C hardened tree sap
- D wet, sticky tree sap

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2 Which of the following is an example of a trace fossil?

- A preserved footprints
- B hardened tree sap
- C a frozen mammoth
- D mold and cast

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3 Which kind of temperatures will slow down an organism's decay?

- A warm temperatures in a wet climate
- B cool temperatures
- C freezing temperatures
- D hot temperatures

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4 A fossil formed by an animal's movement is a trace fossil.

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5 Mold filled with sediment is a cast.

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6 A mark or cavity made in a sedimentary surface by a shell or other body is a mold.

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